Changes for the Better

MITSUBISHI ELECTRIC

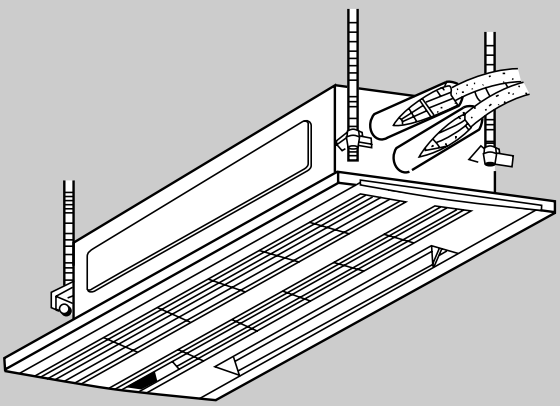
SPLIT-TYPE, HEAT PUMP AIR CONDITIONERS

June 2005
No. OC341

TECHNICAL & SERVICE MANUAL

CITY MULTI Series Ceiling Cassettes R410A / R22

[Models] PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E



INDOOR UNIT

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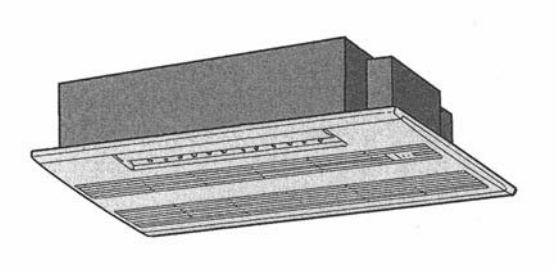
C ETL LISTED US CITY MULTI

1 FEATURES



Indoor Unit

Models	Cooling capacity / Heating capacity
PMFY-P06NBMU-E	6,000 / 6,700 Btu/h
PMFY-P08NBMU-E	8,000 / 9,000 Btu/h
PMFY-P12NBMU-E	12,000 / 13,500 Btu/h
PMFY-P15NBMU-E	15,000 / 17,000 Btu/h

1. Fresh Air Intake

Air recycled indefinitely can become stale and stagnant with air quality suffering significantly. Fresh air is the answer and it is for this reason that the PMFY- series takes in air directly from outdoors. This fresh air intake allows you to enjoy the comfort of crisp, refreshing air in the confines of your living or working space.

2. Light and Compact

The main unit weighs a measly 31 lb. and the panel a mere 7 lb. This makes the PMFY- series one of the lightest in the industry. The unit size is also quite small, having been standardised to a strikingly compact 33-5/8 inch. All of this make the chore of installation and maintenance that much simpler and easier

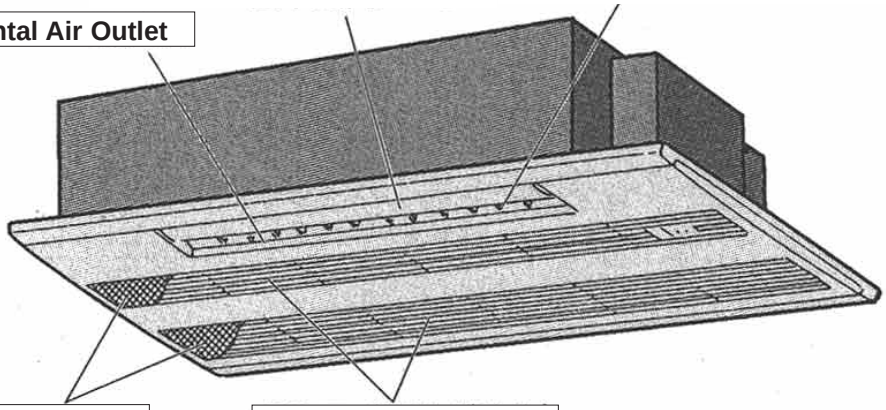
2 PART NAMES AND FUNCTIONS

● Indoor Unit

Auto Air Swing Vane
Disperses airflow up and down and adjusts the angle of airflow direction.

Guide vane
Air flow can be changed horizontally by moving the Guide vane to the left or right.

Horizontal Air Outlet



Filters
Remove dust and pollutants from return air.

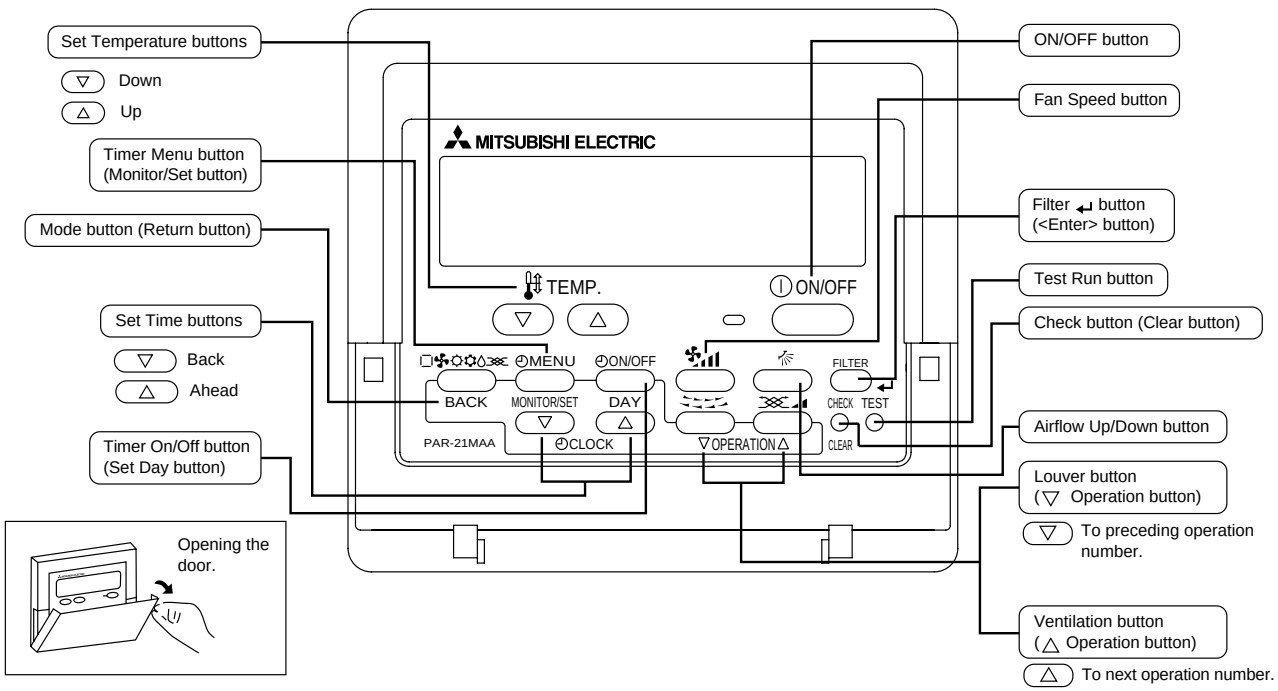
Air intake
Returns air from room.

● Remote controller

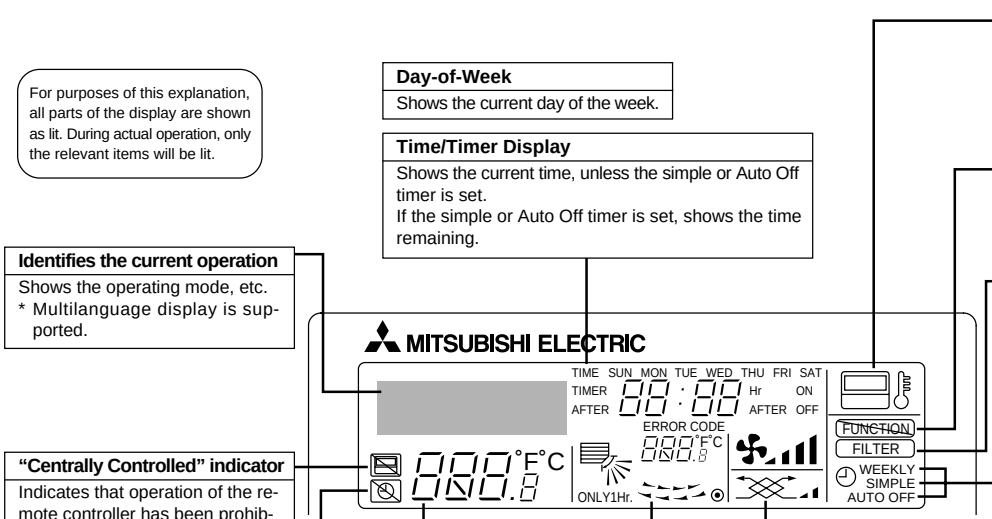
Once the controls are set, the same operation mode can be repeated by simply pressing the ON/OFF button.

● Operation buttons

Note : This figure is PAR-21MAA. Refer to each remote controller manual for the details.



● Display



For purposes of this explanation, all parts of the display are shown as lit. During actual operation, only the relevant items will be lit.

Day-of-Week
Shows the current day of the week.

Time/Timer Display
Shows the current time, unless the simple or Auto Off timer is set.
If the simple or Auto Off timer is set, shows the time remaining.

"Sensor" indication
Displayed when the remote controller sensor is used.

"Locked" indicator
Indicates that remote controller buttons have been locked.

Identifies the current operation
Shows the operating mode, etc.
* Multilanguage display is supported.

"Clean The Filter" indicator
Comes on when it is time to clean the filter.

Timer indicators
The indicator comes on if the corresponding timer is set.

"Centrally Controlled" indicator
Indicates that operation of the remote controller has been prohibited by a master controller.

Fan Speed indicator
Shows the selected fan speed.

Ventilation indicator
Appears when the unit is running in Ventilation mode.

Up/Down Air Direction indicator
The indicator ＼ shows the direction of the outcoming airflow.

Room Temperature display
Shows the room temperature.

Louver display
Indicates the action of the swing louver. Does not appear if the louver is stationary.

"Timer Is Off" indicator
Indicates that the timer is off.

"One Hour Only" indicator
Displayed if the airflow is set to weak and downward during COOL or DRY mode. (Operation varies according to model.)
The indicator goes off after one hour, at which time the airflow direction also changes.

Temperature Setting
Shows the target temperature.

◉ (Power On indicator)
Indicates that the power is on.

Caution

- Only the Power on indicator lights when the unit is stopped and power supplied to the unit.
- If you press a button for a feature that is not installed at the indoor unit, the remote controller will display the "Not Available" message.
- When power is turned ON for the first time, it is normal that "PLEASE WAIT" is displayed on the room temperature indication (For max. 2minutes). Please wait until this "PLEASE WAIT" indication disappear then start the operation.

3 SPECIFICATION

3-1. Specification

Item				PMFY-P06NBMU-E	PMFY-P08NBMU-E	PMFY-P12NBMU-E	PMFY-P15NBMU-E
Power			V･Hz	Single phase 208-230V 60Hz			
Cooling capacity			Btu/h	6,000	8,000	12,000	15,000
Heating capacity			Btu/h	6,700	9,000	13,500	17,000
Electric characteristic	Input	Cooling	kW	0.042	0.042	0.044	0.054
		Heating	kW	0.042	0.042	0.044	0.054
	Current	Cooling	A	0.20	0.20	0.21	0.26
		Heating	A	0.20	0.20	0.21	0.26
Exterior (munsell symbol)			—	Unit : Galvanized sheets · Standard grills : ABS resin acrylic coating Munsell<0.98Y 8.99/0.63>			
Dimensions		Height	in.	9-1/16<1-3/16>			
		Width	in.	31-15/16<39-3/8>			
		Depth	in.	15-9/16<18-1/2>			
Heat exchanger			—	Cross fin			
Fan	Fan × No		—	Line flow fan × 1			
	Air flow ※3		CFM	230-250-280-300	250-280-300-320		270-300-340-370
	External static pressure		in W.G.	0			
	Fan motor output		kW	0.028			
Insulator			—	Polyethylene sheet			
Air filter			—	PP honey comb fabric			
Pipe dimensions		Gas side	ϕin.	1/2"			
		Liquid side	ϕin.	1/4"			
Unit drain pipe size			ϕin.	1" I.D. (PVC pipe VP-20 connectable)			
Noise level ※3			dB	27-30-33-35	32-34-36-37		33-35-37-39
Product weight			lb.	31<7>			

Note 1. Rating conditions

Cooling: Indoor: D.B. 80°F W.B. 67°F
outdoor: D.B. 95°F W.B. 75°F
Heating: Indoor: D.B. 70°F
outdoor: D.B. 47°F W.B. 43°F

Note 2. The number indicated in < > is just for the grille.

※ 3. Air flow and the noise level are indicated as Low - Medium2 - Medium1 - High.

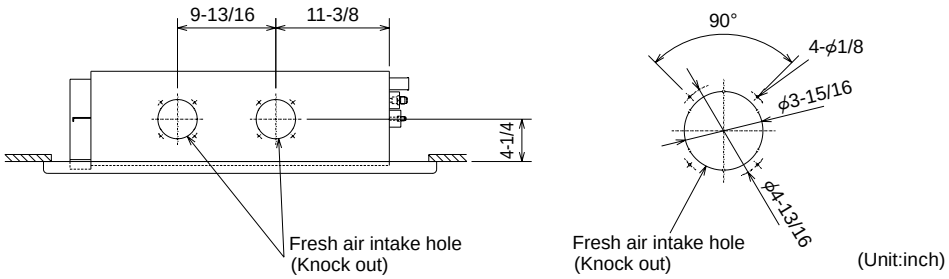
3-2. Electrical parts specifications

Model / Parts name	Symbol	PMFY-P06NBMU-E	PMFY-P08NBMU-E	PMFY-P12NBMU-E	PMFY-P15NBMU-E
Room temperature thermistor	TH21	Resistance 30˚F/15.8kΩ, 50˚F/9.6kΩ, 70˚F/6.0kΩ, 80˚F/4.8kΩ, 90˚F/3.9kΩ, 100˚F/3.2kΩ			
Liquid pipe thermistor	TH22	Resistance 30˚F/15.8kΩ, 50˚F/9.6kΩ, 70˚F/6.0kΩ, 80˚F/4.8kΩ, 90˚F/3.9kΩ, 100˚F/3.2kΩ			
Gas pipe thermistor	TH23	Resistance 30˚F/15.8kΩ, 50˚F/9.6kΩ, 70˚F/6.0kΩ, 80˚F/4.8kΩ, 90˚F/3.9kΩ, 100˚F/3.2kΩ			
Fuse (Indoor controller board)	FUSE	250V 6A			
Fan motor	MF	DC Brushless Motor 8-pole OUTPUT 28W PN0H28-MB			
Vane motor	MV	MSFJC 20M23 12V/380Ω			
Drain pump	DP	PJV-1063 208-240V 50/60Hz			
Drain sensor	DS	Thermistor resistance 30°F/6.3kΩ, 50°F/3.9kΩ, 70°F/2.5kΩ, 80°F/2.0kΩ, 90°F/1.6kΩ, 100°F/1.3kΩ			
Linear expansion valve	LEV	DC12V Stepping motor drive port ϕ3.2 (0~2000pulse) EDM-40YGME			
Power supply terminal block	TB2	(L1, L2, GR) Rated to 330V 30A ※			
Transmission terminal block	TB5	(M1, M2, S) Rated to 250V 20A ※			
MA-remote controller terminal block	TB15	(1,2) Rated to 250V 10A ※			

※ Note : Refer to WIRING DIAGRAM for the supplied voltage.

3-3. Air capacity taken from outside

PMFY-P·NBMU-E series are capable of taking air from outside.
When taking air from outside, the duct fan must be used.
The air capacity should be 20% or less of the air flow SPEC(Hi).



(Unit:inch)

Service Ref.	Air flow (Hi)	Air capacity taken from outside
PMFY-P06NBMU-E	300 CFM	60 CFM
PMFY-P08NBMU-E	320 CFM	64 CFM
PMFY-P12NBMU-E	320 CFM	64 CFM
PMFY-P15NBMU-E	370 CFM	74 CFM

Interlocking operation method with duct fan (Booster fan)

●Whenever the indoor unit is operating, the duct fan must also operate.

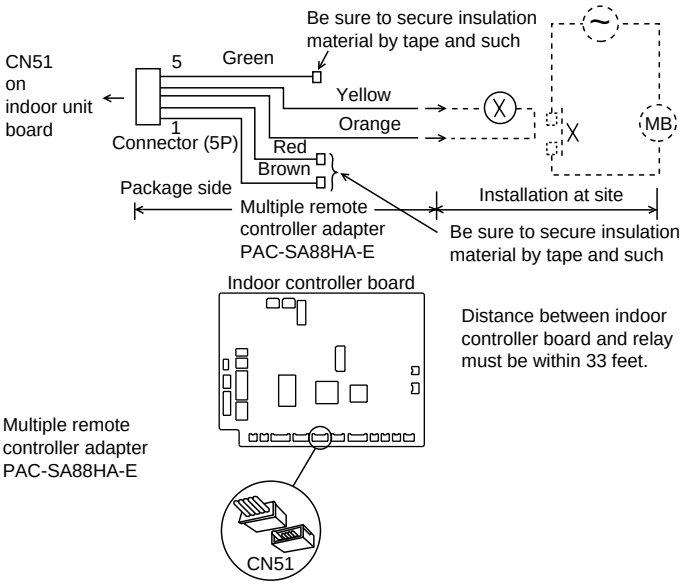
(1)Connect the optional multiple remote controller adaptor (PAC-SA88HA-E) to the connector CN51 on the indoor controller board.

(2)Power the relay by connecting the 12V DC coil terminals from the Yellow and Orange connector lines.

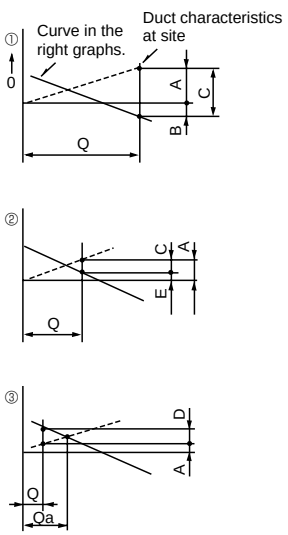
(※)Use a relay under 1W.

MB: Electromagnetic switch power relay for duct fan.

X: Auxiliary relay (12V DC LY-1F)



How to read curves



Q…Planned amount of fresh air intake <CFM>

A…Static pressure loss of fresh air intake duct system with air flow amount Q <in. W.G>

B…Forced static pressure at air conditioner inlet with air flow amount Q <in. W.G>

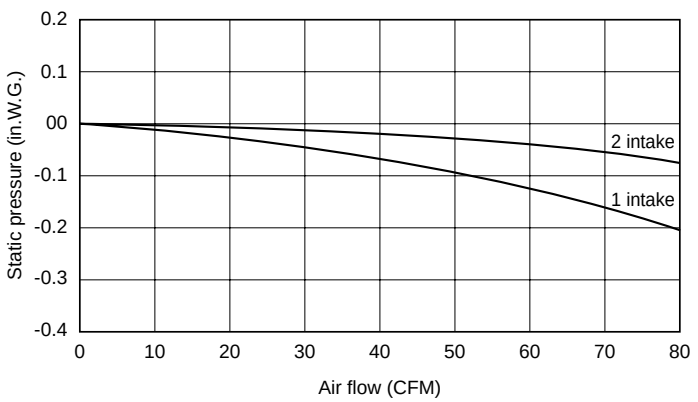
C…Static pressure of booster fan with air flow amount Q <in. W.G>

D…Static pressure loss increase amount of fresh air intake dust system for air flow amount Q <in. W.G>

E…Static pressure of indoor unit with air flow amount Q <in. W.G>

Qa…Estimated amount of fresh air intake with out D <CFM>

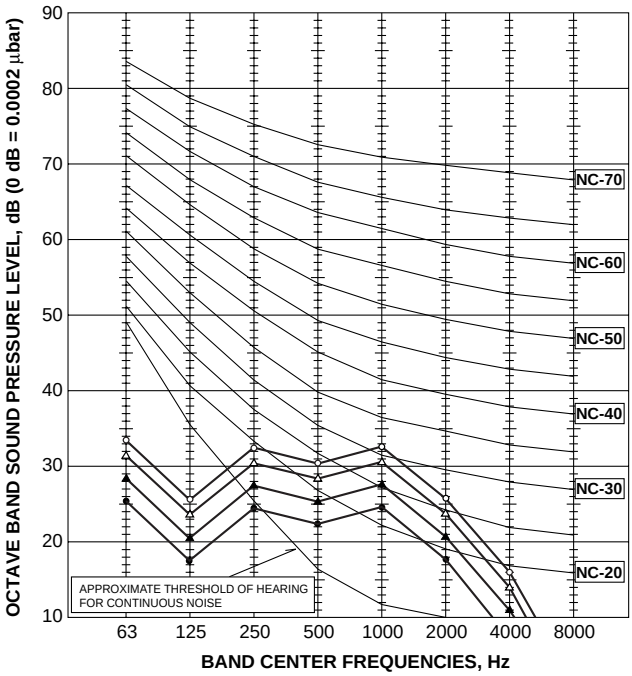
Characteristic diagram of air capacity taken from outside of PMFY-P·NBMU-E



3-4. NOISE CRITERION CURVES

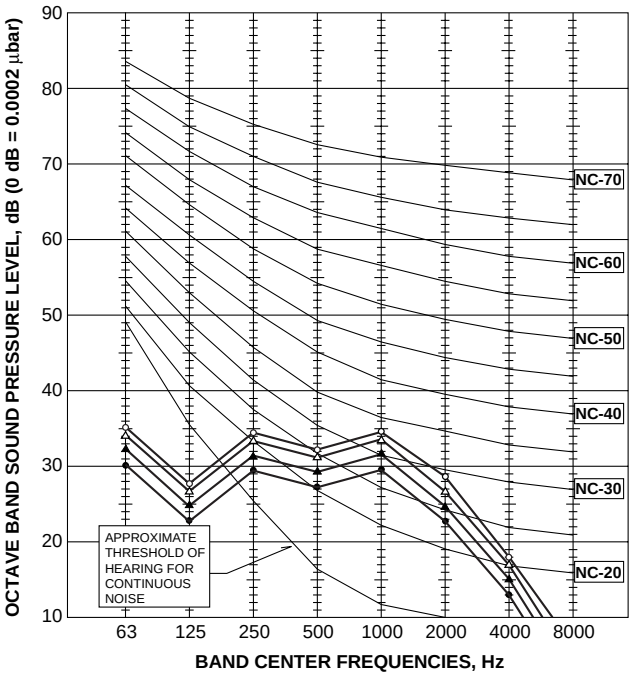
PMFY-P06NBMU-E

NOTCH	SPL(dB)	LINE
High	35	○—○
Medium1	33	△—△
Medium2	30	▲—▲
Low	27	●—●



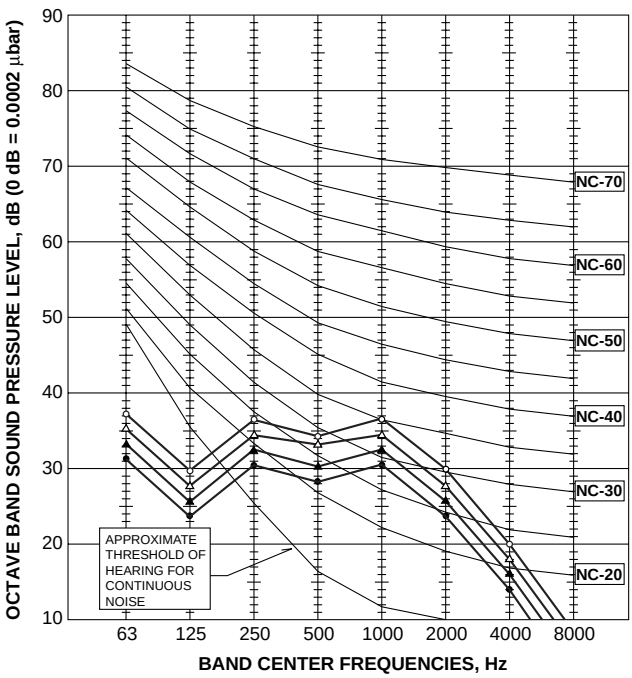
PMFY-P08NBMU-E
PMFY-P12NBMU-E

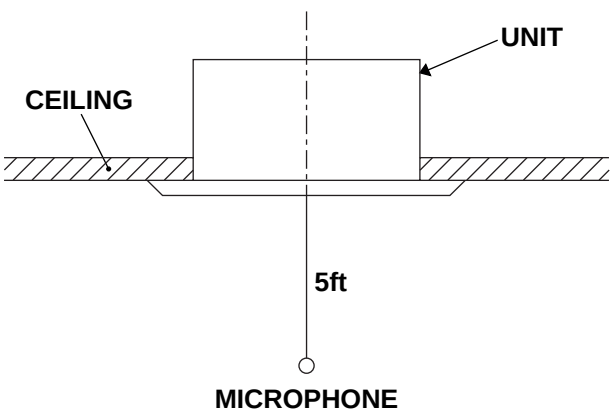
NOTCH	SPL(dB)	LINE
High	37	○—○
Medium1	36	△—△
Medium2	34	▲—▲
Low	32	●—●



PMFY-P15NBMU-E

NOTCH	SPL(dB)	LINE
High	39	○—○
Medium1	37	△—△
Medium2	35	▲—▲
Low	33	●—●

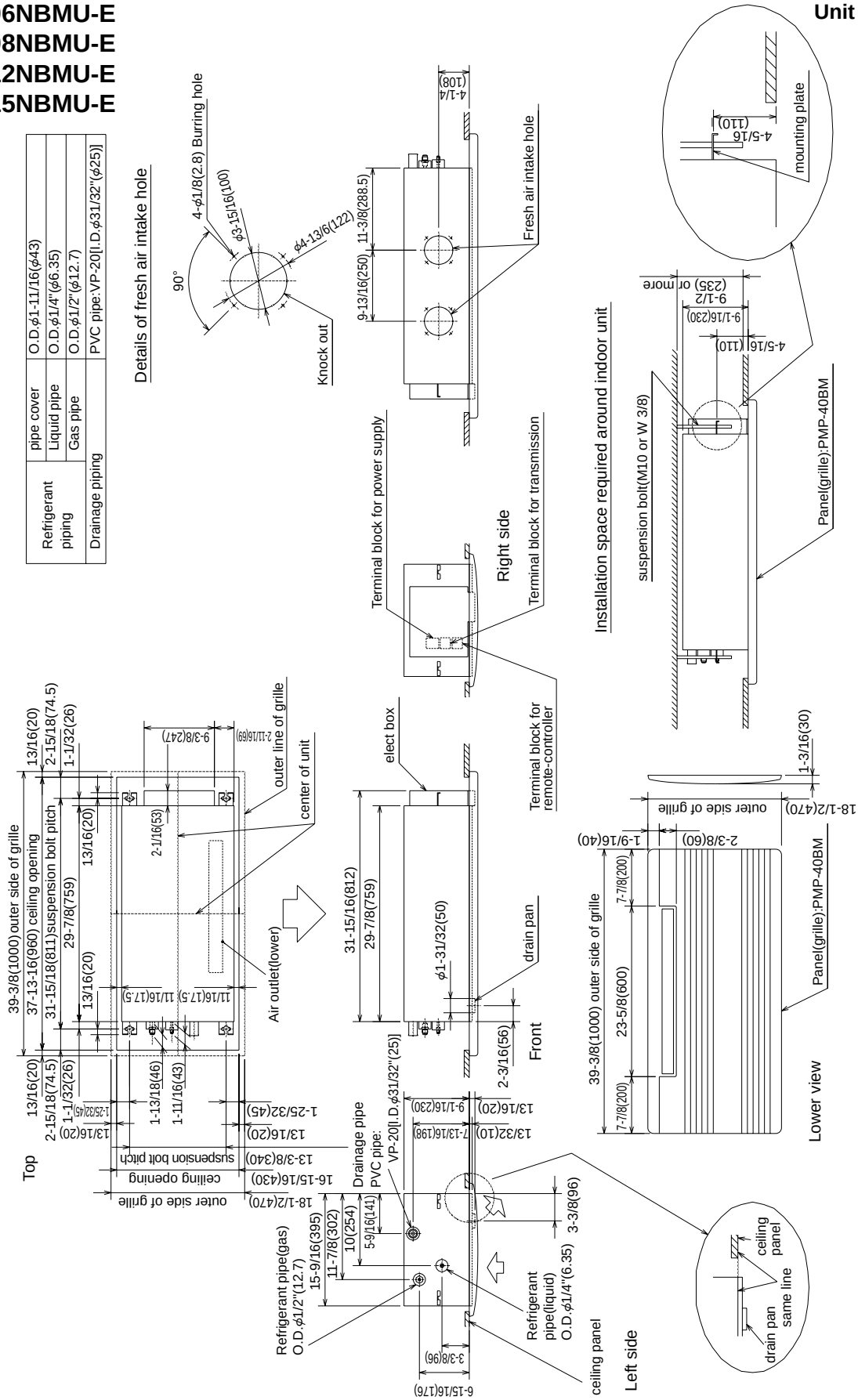




4 OUTLINES AND DIMENSIONS

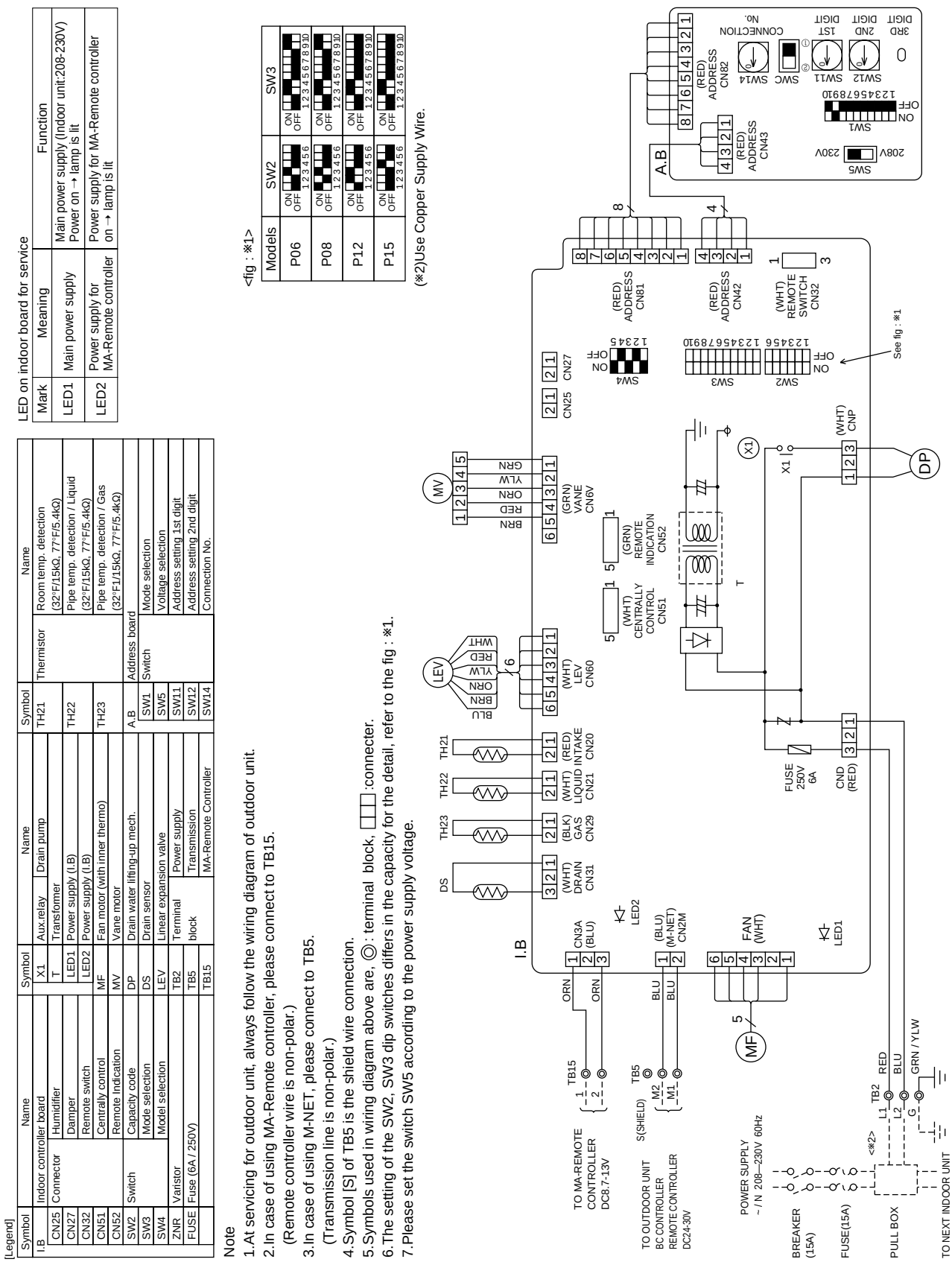
PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E

Unit : in. (mm)



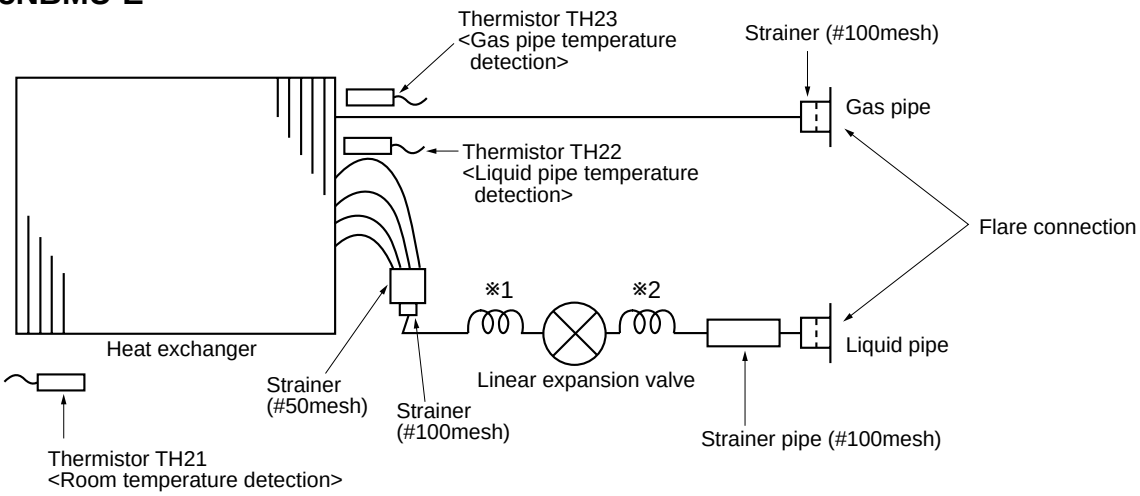
5 WIRING DIAGRAM

PMFY-P06NBMU-E PMFY-P08NBMU-E
PMFY-P12NBMU-E PMFY-P15NBMU-E


[Legend]
Symbol | Name | Symbol | Name | Symbol | Name
I.B | Indoor controller board | X1 | Aux.relay | Drain pump | TH21 | Thermistor | Room temp. detection (32°F/15kΩ, 77°F/5.4kΩ)
CN25 | Connector | Humidifier | T | Transformer | | | Pipe temp. detection / Liquid (32°F/15kΩ, 77°F/5.4kΩ)
CN27 | | Damper | LED1 | Power supply (I.B) | TH22 | | Pipe temp. detection / Gas (32°F1/15kΩ, 77°F/5.4kΩ)
CN32 | | Remote switch | LED2 | Power supply (I.B) | | | Address setting 1st digit
CN51 | | Centrally control | MF | Fan motor (with inner thermo) | TH23 | | Address setting 2nd digit
CN52 | | Remote Indication | MV | Vane motor | | | Connection No.
SW2 | Switch | Capacity code | DP | Drain water lifting-up mech. | A.B | Address board
SW3 | | Mode selection | DS | Drain sensor | SW1 | Switch | Mode selection
SW4 | | Model selection | LEV | Linear expansion valve | SW5 | | Voltage selection
ZNR | Varistor | | TB2 | Terminal | Power supply | SW11 | | Address setting 1st digit
FUSE | Fuse (6A / 250V) | | TB5 | block | Transmission | SW12 | | Address setting 2nd digit
| | | TB15 | | MA-Remote Controller | SW14 | | Connection No.
LED on indoor board for service
Mark | Meaning | Function
LED1 | Main power supply | Main power supply (Indoor unit:208-230V) Power on → lamp is lit
LED2 | Power supply for MA-Remote controller | Power supply for MA-Remote controller on → lamp is lit
<fig : ※1>
Models | SW2 | SW3
P06 | P08 | P12 | P15
(※2)Use Copper Supply Wire.
Note
1.At servicing for outdoor unit, always follow the wiring diagram of outdoor unit.
2.In case of using MA-Remote controller, please connect to TB15.
(Remote controller wire is non-polar.)
3.In case of using M-NET, please connect to TB5.
(Transmission line is non-polar.)
4.Symbol [S] of TB5 is the shield wire connection.
5.Symbols used in wiring diagram above are, ◎: terminal block, □□□:connecter.
6.The setting of the SW2, SW3 dip switches differs in the capacity for the detail, refer to the fig : ※1.
7.Please set the switch SW5 according to the power supply voltage.
I.B
A.B
DS
TH23
TH22
TH21
LEV
MV
MF
DP
LED1
LED2
FUSE 250V 6A
CND (RED)
(WHT) CNP
(WHT) REMOTE SWITCH CN32
(RED) ADDRESS CN42
(RED) ADDRESS CN81
(RED) ADDRESS CN82
(RED) ADDRESS CN43
(WHT) CENTRALLY CONTROL CN51
(GRN) REMOTE INDICATION CN52
(GRN) VANE CN6V
(WHT) LEV CN60
(WHT) DRAIN CN31
(BLK) GAS CN29
(WHT) LIQUID CN21
(RED) INTAKE CN20
CN3A (BLU)
(BLU) (M-NET) CN2M
CN25
CN27
SW1
SW2
SW3
SW4
SW5
SW11
SW12
SW14
SWC
See fig : ※1
TO MA-REMOTE CONTROLLER DC8.7-13V
TO OUTDOOR UNIT BC CONTROLLER REMOTE CONTROLLER DC24-30V
S(SHIELD)
POWER SUPPLY ~ / N 208—230V 60Hz
BREAKER (15A)
FUSE(15A)
PULL BOX
TO NEXT INDOOR UNIT
TB15
TB5
TB2
<※2>
ORN
BLU
RED
GRN / YLW
BRN
RED
ORN
YLW
GRN
WHT
BLU
208V
230V
CONNECTION No.
1ST DIGIT
2ND DIGIT
3RD DIGIT

6 REFRIGERANT SYSTEM DIAGRAM

PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E



Unit:in.(mm)

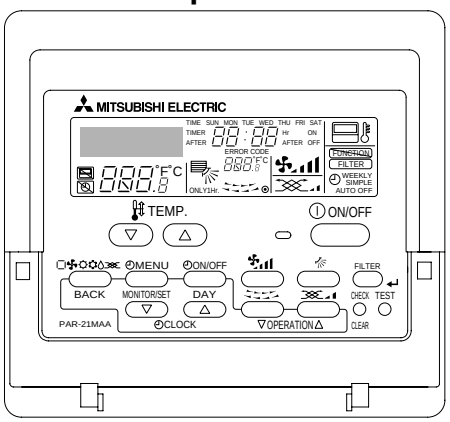
Service Ref. / Item	PMFY-P06/ P08/ P12/ P15NBMU-E
Gas pipe	ϕ1/2"(12.7)
Liquid pipe	ϕ1/4"(6.35)

Unit:mm

	PMFY-P06/ P08NBMU-E	PMFY-P12/ P15NBMU-E
Capillary tube ※1	O.D.ϕ4.6 × I.D.ϕ3.4 × ℓ 200	O.D.ϕ3.6 × I.D.ϕ2.4 × ℓ 200
Capillary tube ※2	O.D.ϕ3.6 × I.D.ϕ2.4 × ℓ 80	

7 MICROPROCESSOR CONTROL

INDOOR UNIT CONTROL
7-1. COOL operation



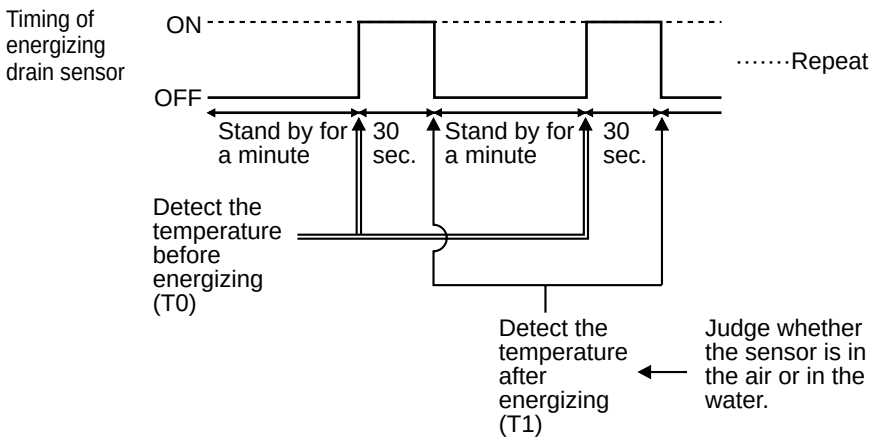
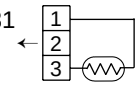
<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display COOL.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 2°F when the ▽ or △ button is pressed one time Cooling 67 to 87°F.

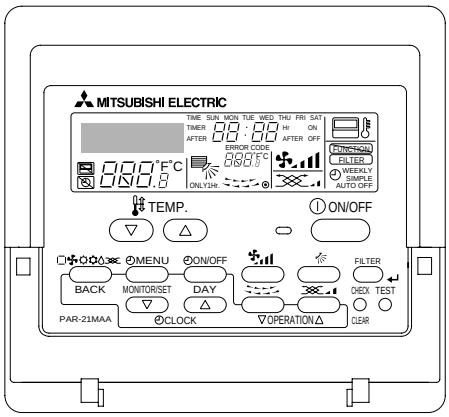
Control modes	Control details	Remarks
1. Functions regulated by temperature	1-1. Functions regulated by temperature • Room temperature ≧ desired temperature + 2°F ⋯Thermostat ON • Room temperature ≦ desired temperature ⋯Thermostat OFF	
	1-2. Anti-freezing control Detected condition : When the liquid pipe temp. (TH22) is 32°F or less in 16 minutes from compressors start up, anti-freezing control starts and the thermostat OFF. Released condition : The timer which prevents reactivating is set for 3 minutes, and anti- freezing control is cancelled when any one of the following conditions is satisfied. ① Liquid pipe temp. (TH22) turn 50°F or above. ② The condition of the thermostat OFF has become complete by thermoregulating, etc. ③ The operation mode becomes a mode other than COOL. ④ The operation stopped. 1-3. Compressor time delay • 3 minutes minimum off cycle.	
2. Fan	By the remote controller setting (switch of 4 speeds) Type: 4 speeds type — Fan speed notch: [Low], [Medium2], [Medium1], [High]	

To be continued on the next page.

From the preceding page.

Control modes	Control details	Remarks
3. Drain pump	3-1. Drain pump control •Always drain pump ON during the COOL and DRY mode operation. (Regardless of the thermostat ON/ OFF) •When the operation mode is changed from COOL or DRY to any other mode (including Stop), the drain pump continues to run for 3 minutes.	
	Drain sensor function • The indoor circuit board energizes the drain sensor at a fixed voltage for a fixed duration. After energizing, the circuit board then compares the drain sensor's temperature to the one before energizing, and judges whether the sensor is in the air or in the water. **Basic control system** • While drain pump is turned on, it will repeat the following control system and judge whether the sensor is in the air or in the water.  •Drain sensor temperature rise (Δt) •Temperature of drain sensor before current is applied (T_0) •Temperature of drain sensor after current is applied (T_1) [$\Delta t = T_1 - T_0$]	⁎1 Drain sensor Indoor controller board CN31 
4. Vane (up/ down vane change)	(1) Initial setting : Start at COOL mode and horizontal vane. (2) Vane position : Horizontal →Downward A →Downward B →Downward C→Swing (3) Restriction of the downward vane setting When setting the downward vane A, B or C in [Medium1], [Medium2] or [Low] of the fan speed notch, the vane changes to horizontal position after 1 hour has passed.	⁎1 "SET FOR 1 HOUR" appears on the wired remote controller.

7-2. DRY operation

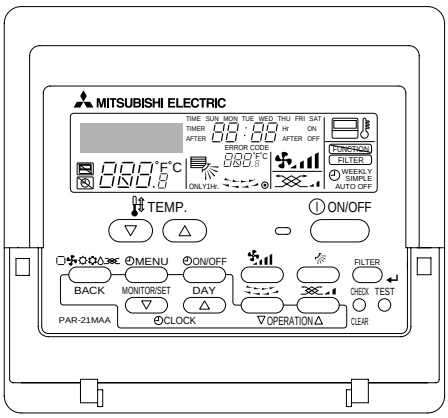


<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display DRY.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 2°F when the ▽ or △ button is pressed one time. Dry 67 to 87°F.

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Functions regulated by temperature</td><td>1-1. Dry mode temperature is controlled by TH21.
Dry mode ON Room temperature ≧ desired temperature + 2°F
Dry mode OFF Room temperature ≦ desired temperature
<table>
<tr><th rowspan="2">Room temperature</th><th colspan="2">3 min. passed since starting operation</th><th rowspan="2">Dry mode ON time (min)</th><th rowspan="2">Dry mode OFF time (min)</th></tr>
<tr><th>Call</th><th>Room temperature (Ta)</th></tr>
<tr><td rowspan="5">Over 64°F</td><td rowspan="4">ON</td><td>Ta ≧ 83°F</td><td>9</td><td>3</td></tr>
<tr><td>83°F > Ta ≧ 79°F</td><td>7</td><td>3</td></tr>
<tr><td>79°F > Ta ≧ 75°F</td><td>5</td><td>3</td></tr>
<tr><td>75°F > Ta</td><td>3</td><td>3</td></tr>
<tr><td>OFF</td><td>Unconditional</td><td>3</td><td>10</td></tr>
<tr><td>Less than 64°F</td><td colspan="4">Dry mode OFF</td></tr>
</table></td><td></td></tr>
<tr><td></td><td>1-2. Frozen prevention control
No control function</td><td></td></tr>
<tr><td>2. Fan</td><td>Indoor fan operation control depends on the compressor conditions.
<table>
<tr><th>Dry mode</th><th>Fan speed notch</th></tr>
<tr><td>ON</td><td>[Low]</td></tr>
<tr><td>OFF</td><td>Stop</td></tr>
</table>
Note: Remote controller setting is not acceptable.</td><td></td></tr>
<tr><td>3. Drain pump</td><td>Same control as COOL operation</td><td></td></tr>
<tr><td>4. Vane
(up/ down vane change)</td><td>Same control as COOL operation</td><td></td></tr>
</table>

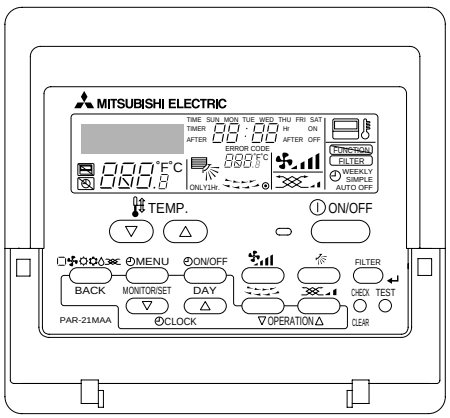
7-3. FAN operation



<How to operate>
① Press POWER ON/OFF button.
② Press the operation MODE button to display FAN.

Control modes	Control details	Remarks
1. Fan	Set by remote controller. Type: 4 speeds type — Fan speed notch: [Low], [Medium2], [Medium1], [High]	
2. Drain pump	2-1. Drain pump control The drain pump turns ON for the specified amount of time when any of the following conditions are met: ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode (FAN). ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor piping (liquid piping) temperature – indoor room temperature ≦ -18°F, AND the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for a further 6 minutes.)	
	2-2. Liquid level detection method The liquid level is detected by determining whether or not the drain sensor is submerged, based on the amount the temperature rises after self-heating the sensor. This process is performed if any of the following conditions is met: ① Drain pump is ON. ② Indoor piping (liquid piping) temperature – indoor room temperature ≦ -18°F ③ Indoor piping (liquid piping) temperature or indoor room temperature is at the short or open level temperature. ④ Every hour after the drain pump has been switched from ON to OFF.	
3. Vane (up/ down vane change)	Same as the control performed during the COOL operation, but with no restriction on the vane's downward blow setting.	

7-4. HEAT operation



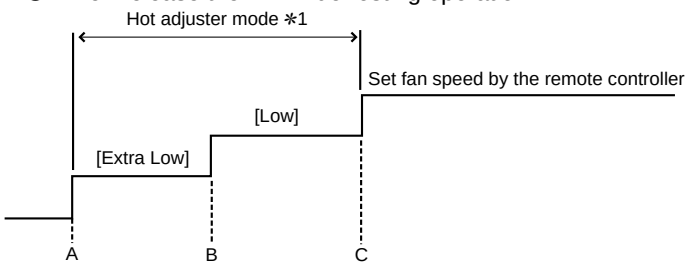
<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display HEAT.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 2°F when the ▽ or △ button is pressed one time. Heating 63 to 83°F.

<Display in HEAT operation>

[DEFROST]
The [DEFROST] symbol is only displayed during the defrost operation.

[STANDBY]
The [STANDBY] symbol is only displayed from the time the heating operation starts until the heated air begins to blow.

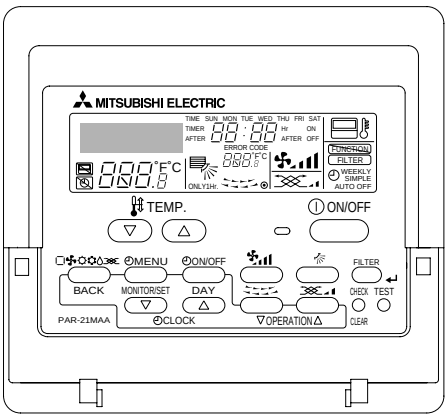
Control modes	Control details	Remarks
1. Functions regulated by temperature	1-1. Minimum compressor off cycle is 3 minutes. • Room temperature ≦ desired temperature -2°F ⋯Thermostat ON • Room temperature ≧ desired temperature ⋯Thermostat OFF	
2. Fan	Controlled by the remote controller (4-speed) Give priority to under-mentioned controlled mode 2-1. Stand by (hot adjuster) mode 2-2. Preheating exclusion mode 2-3. Thermostat OFF mode (When the compressor off by the thermoregulating) 2-4. Cool air prevention mode (Defrosting mode)	
	2-1. Stand by (hot adjuster) mode The fan controller becomes the stand by (hot adjuster) mode for the following conditions. ① When starting the HEAT operation ② When the thermoregulating function changes from OFF to ON. ③ When release the HEAT defrosting operation  A: Stand by (hot adjuster) mode start B: 5 minutes have passed since the condition A or the indoor liquid pipe temperature turned 95°F or more C: 2 minutes have passed since the condition A (Terminating the stand by (hot adjuster) mode)	∗1 "STAND BY" will be displayed during the stand by (hot adjuster) mode.
	2-2. Preheating exclusion mode When the condition changes the auxiliary heater ON to OFF (thermoregulating or operation stop, etc), the indoor fan operates in [Low] mode for 1 minute.	∗1 This control is same for the model without auxiliary heater.

To be continued on the next page.

From the preceding page.

Control modes	Control details	Remarks
2. Fan	2-3. Thermostat OFF mode When the thermoregulating function changes to OFF, the indoor fan operates in [Extra low].	
	2-4. Heat defrosting mode The indoor fan stops.	
3. Drain pump	No drain pump operation However, when the control changes from COOL or DRY operation, the drain pump operates for 3 minutes.	
4. Vane control (Up/ down vane change)	(1) Initial setting : OFF → HEAT⋯[last setting] When changing the mode from exception of HEAT to HEAT operation. ⋯[Downward C] (2) Vane position : Horizontal →Downward A →Downward B →Downward C→Swing (3) Restriction of vane position ① The vane is horizontally fixed for the following modes. (The control by the remote controller is temporally invalidated and controlled by the unit.) •Thermostat OFF •Stand by (hot adjuster) [Extra low] mode •Heat defrost mode	

7-5. AUTO operation [Automatic COOL/HEAT change over operation]



<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display AUTO.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 2°F when the ▽ or △ button is pressed one time. Automatic 67 to 83°F.
When in AUTO mode, the unit will switch from either heat or cool automatically to maintain the set temperature.

Control modes	Control details	Remarks
1. Initial value of operation mode	HEAT mode for room temperature < Desired temperature COOL mode for room temperature ≧ Desired temperature	
2. Mode change	(1) HEAT mode → COOL mode Room temperature ≧ Desired temperature + 3°F. or 3 min. has passed (2) COOL mode → HEAT mode Room temperature ≦ Desired temperature - 3°F. or 3 min. has passed	
3. COOL mode	Same control as cool operation	
4. HEAT mode	Same control as heat operation	

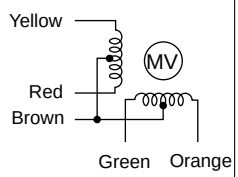
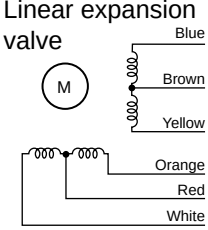
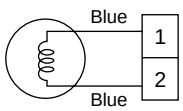
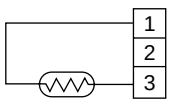
7-6. When unit is stopped Control mode

Control modes	Control details	Remarks
1. Drain pump	1-1. Drain pump control The drain pump turns ON for the specified amount of time when any of the following conditions are met (regardless of whether the compressor is ON or OFF) ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode (HEAT mode). ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor piping (liquid piping) temperature – indoor room temperature ≦ 14°F, AND the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for a further 6 minutes.)	
	1-2. Liquid level detection method The liquid level is detected by determining whether or not the drain sensor is submerged, based on the amount the temperature rises after self-heating the sensor. This process is performed if any of the following conditions is met: ① Drain pump is ON. ② Indoor piping (liquid piping) temperature – indoor room temperature ≦ 14°F (except during defrosting) ③ Indoor piping (liquid piping) temperature or indoor room temperature is at the short or open level temperature. ④ Every hour after the drain pump has been switched from ON to OFF.	

8 TROUBLE SHOOTING

8-1. How to check the parts

PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E

<table>
<tr><th>Parts name</th><th>Check points</th></tr>
<tr><td>Thermistor (TH21)
<Room temperature detection>
Thermistor (TH22)
<Liquid pipe temperature detection>
Thermistor (TH23)
<Gas pipe temperature detection></td><td>Disconnect the connector then measure the resistance using a tester.
(Surrounding temperature 50°F~86°F)
<table><tr><th>Normal</th><th>Abnormal</th></tr><tr><td>4.3kΩ~9.6kΩ</td><td>Open or short</td></tr></table>Refer to the next page for the details.</td></tr>
<tr><td>Vane motor
 
</td><td>Measure the resistance between the terminals using a tester.
(Surrounding temperature 68°F~86°F)
<table><tr><th>Connector</th><th>Normal</th><th>Abnormal</th></tr><tr><td>Brown — Yellow</td><td rowspan="4">380Ω ±7%</td><td rowspan="4">Open or short</td></tr><tr><td>Brown — Red</td></tr><tr><td>Brown — Orange</td></tr><tr><td>Brown — Green</td></tr></table></td></tr>
<tr><td>Linear expansion valve
 
</td><td>Disconnect the connector then measure the resistance using a tester.
<table><tr><th colspan="4">Normal</th><th>Abnormal</th></tr><tr><td>White-Red</td><td>Yellow-Brown</td><td>Orange-Red</td><td>Blue-Brown</td><td rowspan="2">Open or short</td></tr><tr><td colspan="4">150kΩ ±10%</td></tr></table>Refer to the next page for the details.</td></tr>
<tr><td>Drain pump
 
</td><td>Measure the resistance between the terminals using a tester.
(Surrounding temperature 68°F)
<table><tr><th>Normal</th><th>Abnormal</th></tr><tr><td>400Ω~480Ω</td><td>Open or short</td></tr></table></td></tr>
<tr><td>Drain sensor
 
</td><td>Measure the resistance after 3 minutes have passed since the power supply was turned off.
(Surrounding temperature 32°F~140°F
<table><tr><th>Normal</th><th>Abnormal</th></tr><tr><td>0.6kΩ~6.0kΩ</td><td>Open or short</td></tr></table>Refer to the next page for the details.</td></tr>
</table>

<Thermistor characteristic graph>

Thermistor for lower temperature

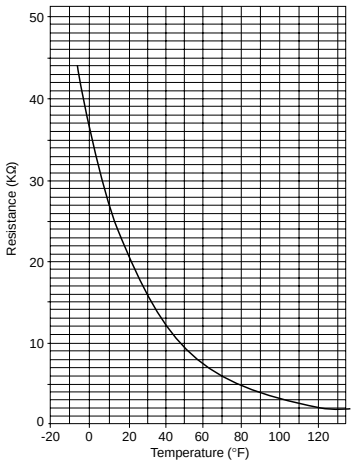
Thermistor <Room temperature detection> (TH21)
Thermistor <Liquid pipe temperature detection> (TH22)
Thermistor <Gas pipe temperature detection> (TH23)

Thermistor R_0=15kΩ ± 3%
Fixed number of B=3480K ± 2%

$$Rt=15\exp\{3480(\frac{1}{273+(t-32)/1.8}-\frac{1}{273})\}$$

30°F	15.8kΩ
50°F	9.6kΩ
70°F	6.0kΩ
80°F	4.8kΩ
90°F	3.9kΩ
100°F	3.2kΩ

< Thermistor for lower temperature >



Thermistor for drain sensor

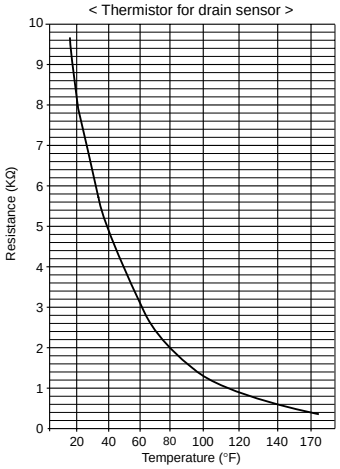
Drain sensor (DS)

Thermistor R_0=6.0k ±5%
Fixed number of B=3390K ±2%

$$Rt=6\exp\{3390(\frac{1}{273+(t-32)/1.8}-\frac{1}{273})\}$$

30°F	6.3kΩ
50°F	3.9kΩ
70°F	2.5kΩ
80°F	2.0kΩ
90°F	1.6kΩ
100°F	1.3kΩ
140°F	0.6kΩ

< Thermistor for drain sensor >

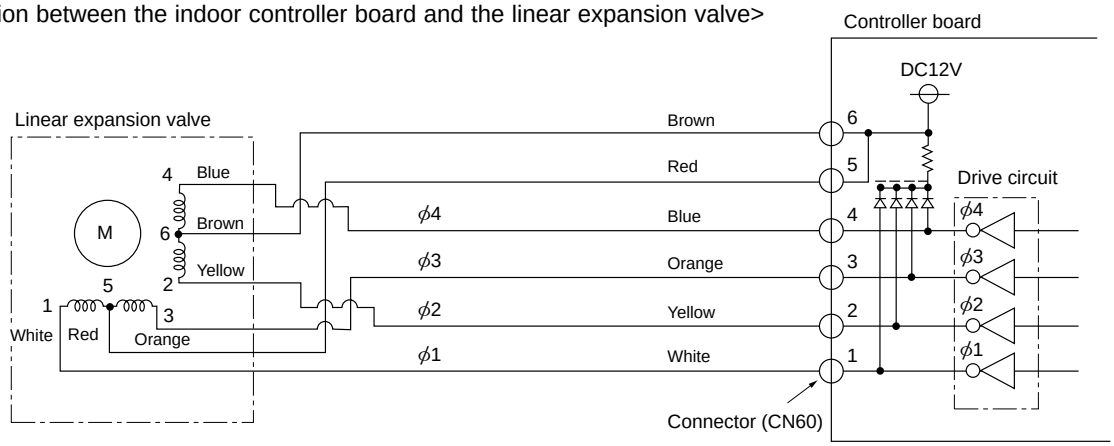


Linear expansion valve

① **Operation summary of the linear expansion valve.**

- Linear expansion valves open/close through the use of a stepping motor after receiving the pulse signal from the indoor controller board.
- Valve position can be changed in proportion to the number of pulse signals.

<Connection between the indoor controller board and the linear expansion valve>



Note : Since the number of the connector at the controller board side and the relay connector are different, follow the color of the lead wire.

<Output pulse signal and the valve operation>

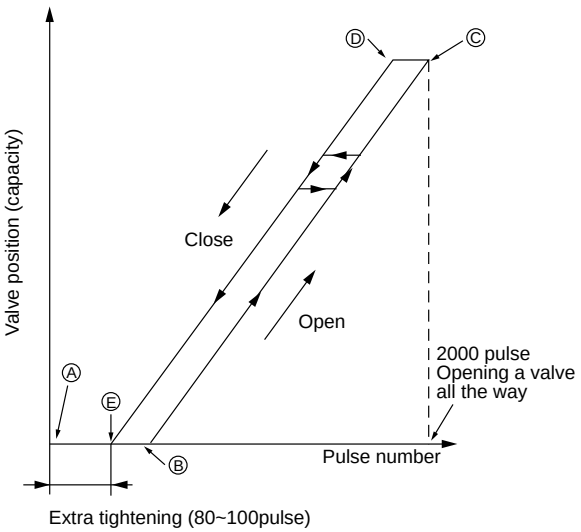
Output (Phase)	Output			
	1	2	3	4
ϕ1	ON	OFF	OFF	ON
ϕ2	ON	ON	OFF	OFF
ϕ3	OFF	ON	ON	OFF
ϕ4	OFF	OFF	ON	ON

Closing a valve : 1 → 2 → 3 → 4 → 1
Opening a valve : 4 → 3 → 2 → 1 → 4

The output pulse shifts in above order.

✺ 1. When linear expansion valve operation stops, all output phase become OFF.
2. At phase interruption or when phase does not shift in order, motor does not rotate smoothly and motor will locks and vibrates.

② Linear expansion valve operation

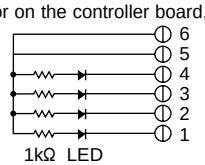
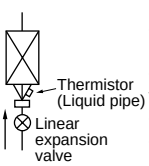


✺ When the switch is turned on, 2200 pulse closing valve signal will be send till it goes to point Ⓐ in order to define the valve position.

When the valve moves smoothly, there is no noise or vibration occurring from the linear expansion valves : however, when the pulse number moves from Ⓔ to Ⓐ or when the valve is locked, more noise can be heard than in a normal situation.

✺ Noise can be detected by placing the ear against the screw driver handle while putting the screw driver tip to the linear expansion valve.

③ Trouble shooting

Symptom	Check points	Countermeasures
Operation circuit failure of the micro processor.	Disconnect the connector on the controller board, then connect LED for checking.  When power is turned on, pulse signals will send for 10 seconds. If the LED does not light or keeps lighting even after the signals stop, that means some failures in the operation circuit.	Exchange the indoor controller board at drive circuit failure.
Linear expansion valve mechanism is locked.	Motor will idle and make a ticking noise when the motor is operated while the linear expansion valve is locked. This ticking sound is the sign of the abnormality.	Exchange the linear expansion vale.
Short or breakage of the motor coil of the linear expansion valve.	Measure the resistance between each coil (white-red, yellow-brown, orange-red, blue-brown) using a tester. It is normal if the resistance is in the range of 150Ω ±10%.	Exchange the linear expansion valve.
Valve doesn't close completely.	To check the linear expansion valve, operate the indoor unit in fan mode and at the same time operate other indoor units in cooling mode, then check the pipe temperature <liquid pipe temperature> of the indoor unit by the outdoor multi controller board operation monitor. During fan operation, linear expansion valve is closed completely and if there is any leaking, detecting temperature of the thermistor will go lower. If the detected temperature is much lower than the temperature indicated in the remote controller, it means the valve is not closed all the way. It is not necessary to exchange the linear expansion valve, if the leakage is small and not affecting normal operation. 	If large amount of thermistor is leaked, exchange the linear expansion valve.
Wrong connection of the connector or contact failure.	Check the color of lead wire and missing terminal of the connector.	Disconnect the connector at the controller board, then check the continuity.

8-2. TROUBLESHOOTING

Check method of indoor fan motor (fan motor / controller board)

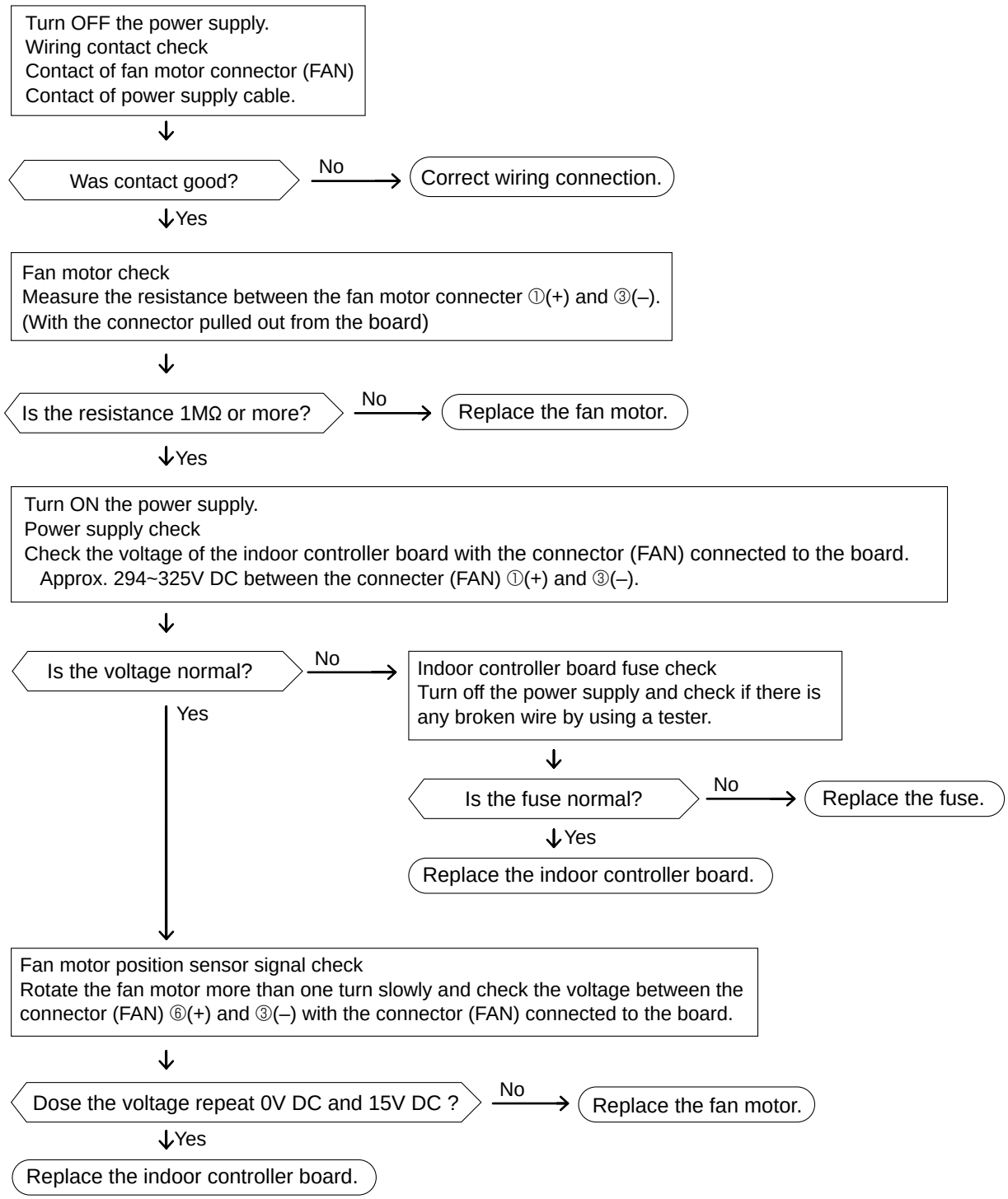
① Notes

· High voltage is applied to the connecter (FAN) for the fan motor. Give attention to the service.

· Do not pull out the connector (FAN) for the motor with the power supply on, doing so may result in damage to the board.

② Self check

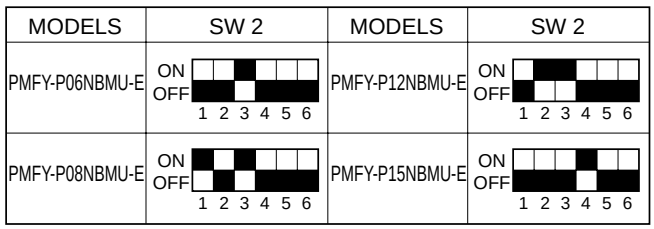
Conditions : The indoor fan does not rotate.


Turn OFF the power supply.
Wiring contact check
Contact of fan motor connector (FAN)
Contact of power supply cable.
Was contact good?
No
Correct wiring connection.
Yes
Fan motor check
Measure the resistance between the fan motor connecter ①(+) and ③(–).
(With the connector pulled out from the board)
Is the resistance 1MΩ or more?
No
Replace the fan motor.
Yes
Turn ON the power supply.
Power supply check
Check the voltage of the indoor controller board with the connector (FAN) connected to the board.
Approx. 294~325V DC between the connecter (FAN) ①(+) and ③(–).
Is the voltage normal?
No
Indoor controller board fuse check
Turn off the power supply and check if there is any broken wire by using a tester.
Is the fuse normal?
No
Replace the fuse.
Yes
Replace the indoor controller board.
Yes
Fan motor position sensor signal check
Rotate the fan motor more than one turn slowly and check the voltage between the connector (FAN) ⑥(+) and ③(–) with the connector (FAN) connected to the board.
Dose the voltage repeat 0V DC and 15V DC ?
No
Replace the fan motor.
Yes
Replace the indoor controller board.

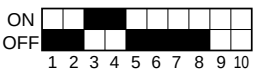
8-3. FUNCTION OF DIP SWITCH

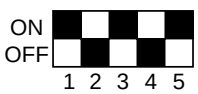
<table>
<tr><th rowspan="2">Switch</th><th rowspan="2">Pole</th><th rowspan="2">Function</th><th colspan="2">Operation by switch</th><th rowspan="2">Effective timing</th><th rowspan="2">Remarks</th></tr>
<tr><th>ON</th><th>OFF</th></tr>
<tr><td rowspan="10">SW1
Function setting</td><td>1</td><td>Thermistor <Room temperature detection> position</td><td>Built-in remote controller</td><td>Indoor unit</td><td rowspan="10">Under suspension</td><td rowspan="10">Address board

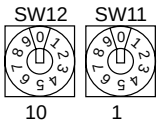
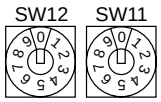
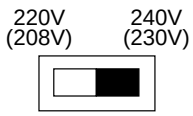
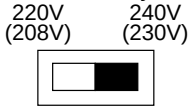
<At delivery>

(※1) Fan operation at Heating mode.
(※2) Heater thermstat ON is operating.
(※3) SW 1-7=OFF, SW 1-8=ON → Setting air flow.
SW 1-7=OFF, SW 1-8=ON → Indoor fan stop.</td></tr>
<tr><td>2</td><td>Filter clogging detection</td><td>Provided</td><td>Not provided</td></tr>
<tr><td>3</td><td>Filter cleaning sign</td><td>2,500hr</td><td>100hr</td></tr>
<tr><td>4</td><td>Fresh air intake</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>5</td><td>Switching remote controller display</td><td>Indicating if the thermostat is ON</td><td>Indicating fan operation ON/OFF</td></tr>
<tr><td>6</td><td>Humidifier control</td><td>Always operated while the heat in ON ※1</td><td>Operated depends on the condition ※2</td></tr>
<tr><td>7</td><td rowspan="2">Air flow at</td><td>Low ※3</td><td>Extra low ※3</td></tr>
<tr><td>8</td><td>Setting air flow</td><td>Depends on SW1-7</td></tr>
<tr><td>9</td><td>Auto restart function</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>10</td><td>Power ON/OFF by breaker</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>SW2
Capacity code setting</td><td>1~6</td><td colspan="3"> 
</td><td>Before power supply ON</td><td>Indoor controller board
Set while the unit is off.

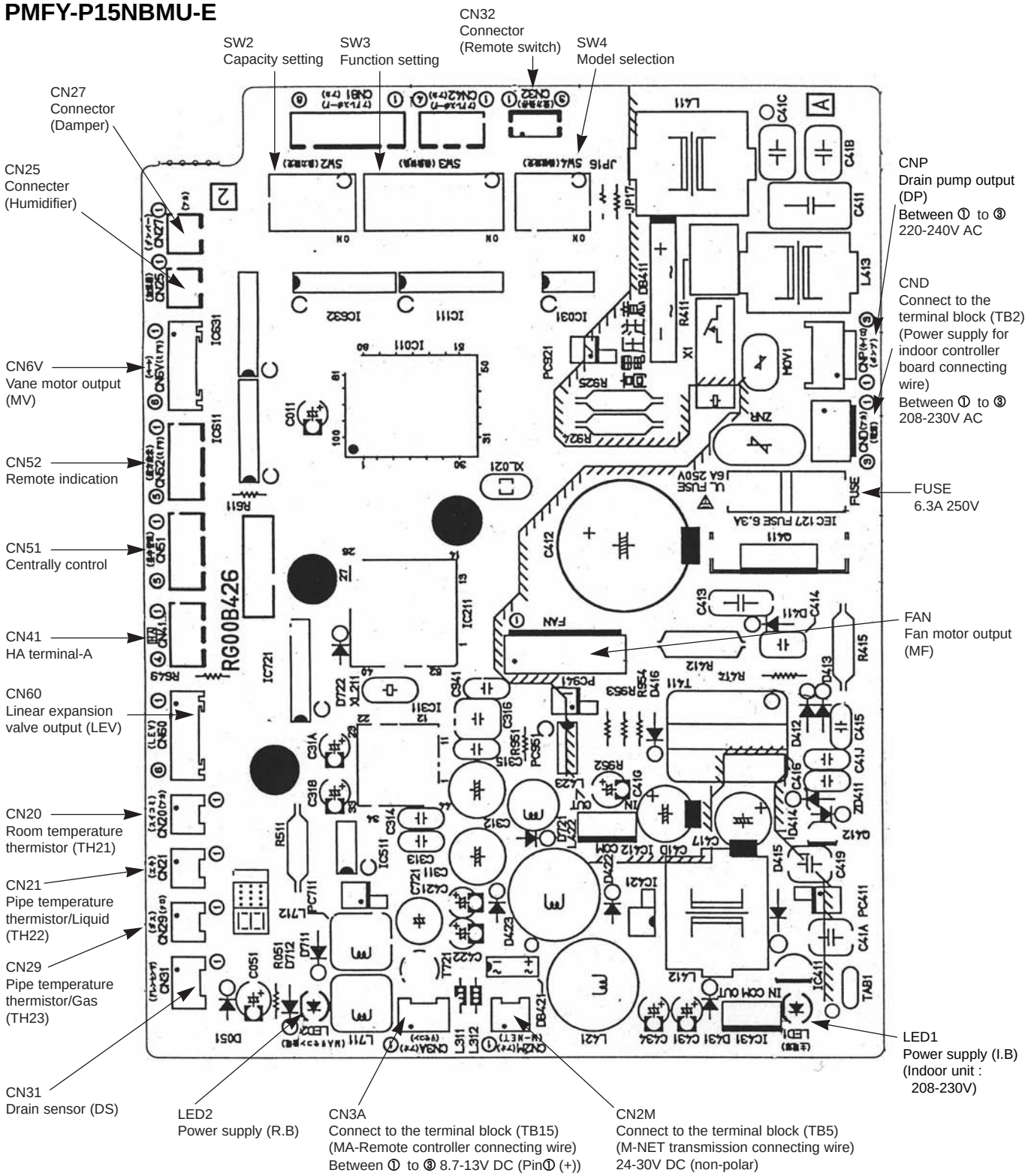
<At delivery>
Set for each capacity.</td></tr>
<tr><td rowspan="11">SW3
Function setting</td><td>1</td><td>Heat pump / Cool only</td><td>Cooling only</td><td>Heat pump</td><td rowspan="11">Under suspension</td><td rowspan="11">Indoor controller board
Set while the unit is off.

<At delivery>
 

(※4) At cooling mode, each angle can be used only 1 hour.
(※5) SW 3-9 setting
PMFY-P06, P08NBMU-E=ON
PMFY-P12, P15NBMU-E=OFF
SW 3-10 setting
PMFY-P06, P08NBMU-E=ON
PMFY-P12, P15NBMU-E=OFF
(※6) The numerical valve in the parentheses shows the case which the R22 outdoor unit is connected.</td></tr>
<tr><td>2</td><td>Louver</td><td>Available</td><td>Not available</td></tr>
<tr><td>3</td><td>Vane</td><td>Available</td><td>Not available</td></tr>
<tr><td>4</td><td>Vane swing function</td><td>Available</td><td>Not available</td></tr>
<tr><td>5</td><td>Vane horizontal angle</td><td>Second setting</td><td>First setting</td></tr>
<tr><td>6</td><td>Vane cooling limit angle setting ※4</td><td>Horizontal angle</td><td>Down B, C</td></tr>
<tr><td>7</td><td>Changing the opening of linear expansion valve when the thermostat is OFF</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>8</td><td>Heating 4deg. up</td><td>Not effective</td><td>Effective</td></tr>
<tr><td>9</td><td>Target superheat setting ※5</td><td>9deg. (5deg.) ※6</td><td>6deg. (2deg.) ※6</td></tr>
<tr><td>10</td><td>Target sub cool setting ※5</td><td>15deg.</td><td>10deg.</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>SW4
Model Selection (Setting for PMFY series)</td><td>1~5</td><td colspan="3">In case replacing the indoor controller board, make sure to set the switch to the factory-preset status, which is shown below.
 
</td><td>Before power supply ON</td><td>Indoor controller board</td></tr>
</table>

Switch	Pole	Operation by switch	Effective timing	Remarks
SW11 1st digit address setting SW12 2nd digit address setting	Rotary switch	 Address setting should be done when M-NET remote controller is being used.	Before power supply ON	Address board Address can be set while the unit is stopped. <At delivery> 
SW14 Connection No. setting	Rotary switch	 This is the switch to be used when the indoor unit is operated with R2 series outdoor unit as a set.		Address board <At delivery>
SW5 Voltage Selection	2	 If the unit is used at the 230V area, set the voltage to 230V. If the unit is used at the 208V, set the voltage to 208V.		Address board <At delivery> 

8-4. TEST POINT DIAGRAM
PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E



9 DISASSEMBLY PROCEDURE

PMFY-P06NBMU-E PMFY-P08NBMU-E
PMFY-P12NBMU-E PMFY-P15NBMU-E

Be careful when removing heavy parts.

OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS

1. Removing the intake grille

Opening the air intake grille

(1) Press the PUSH of the air intake grille.(See figure 1)
(2) Put your fingers on both ends of the air intake grille and let it down after the grille clicks.

Removing the air intake grille

(1) Press the PUSH of air intake grille, and pull down both ends with your fingers after the grille clicks. (See figure 1)
(2) Pull out the handle of air intake grille toward you. (See figure 2)
(3) Unhook the string, which secures air intake grille. (See figure 3)

Photo 1

Figure 1

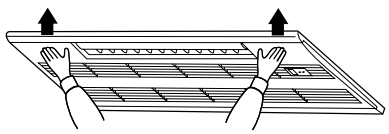


Figure 2

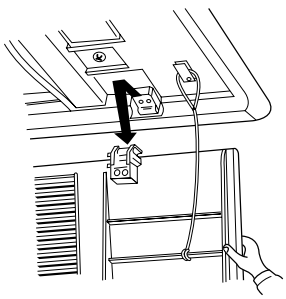
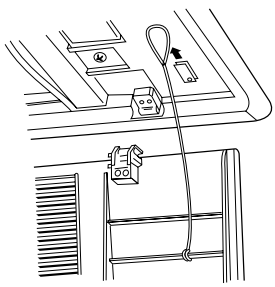
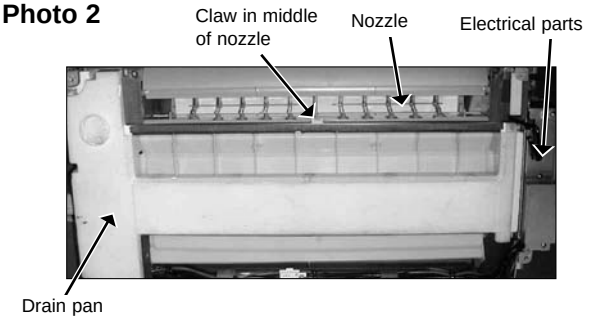
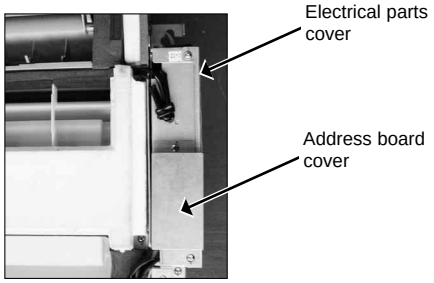
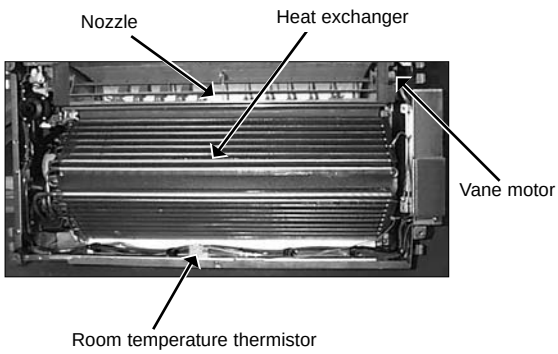
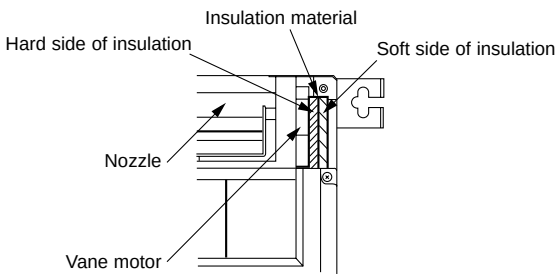
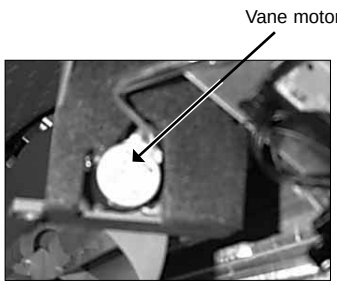
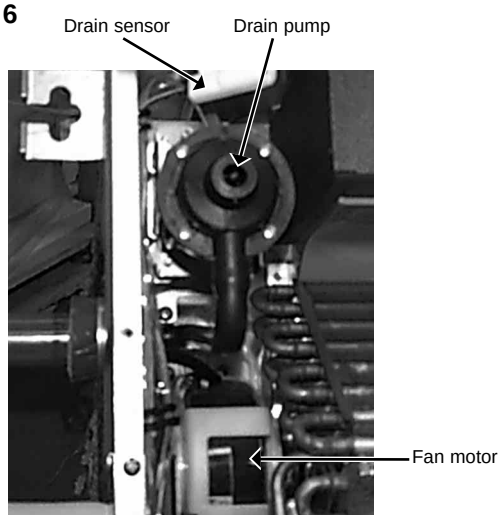
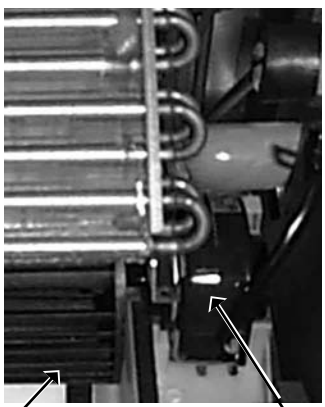


Figure 3

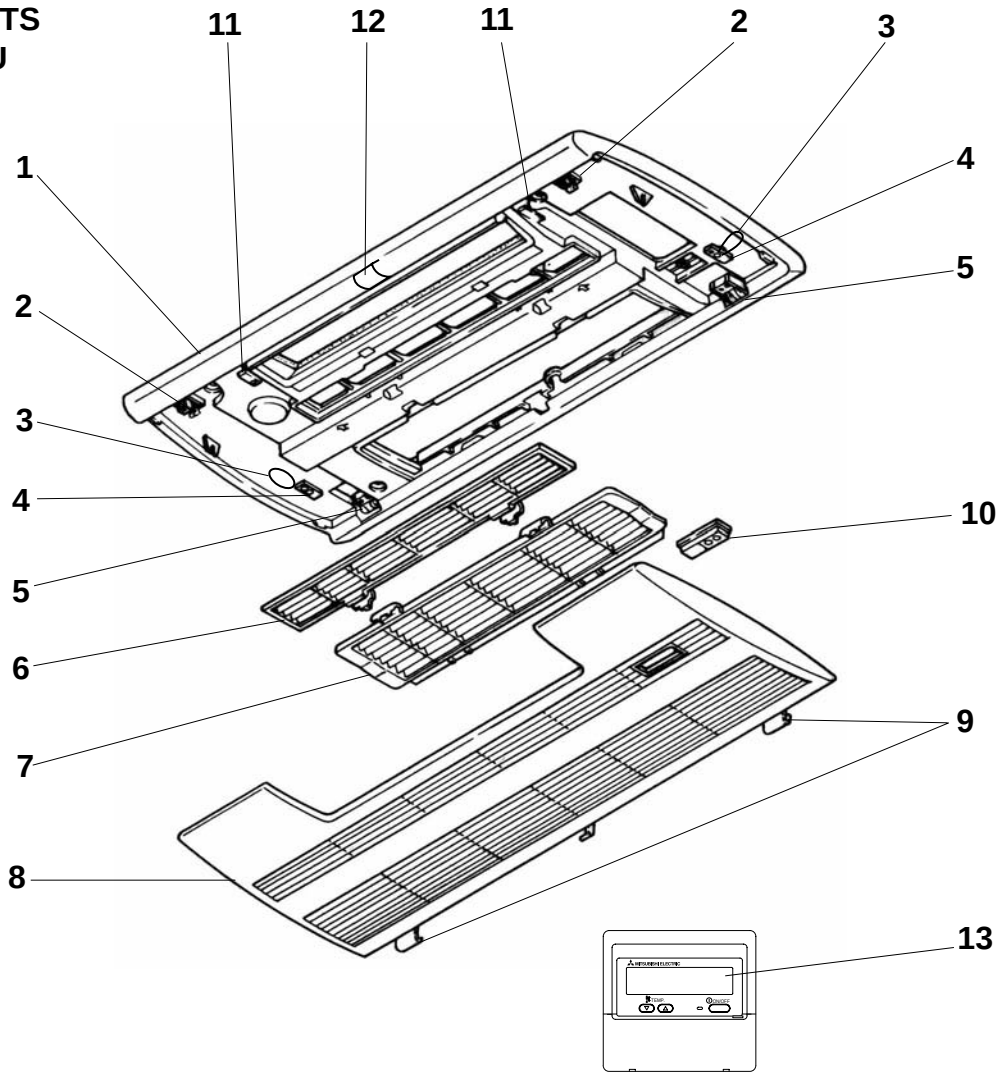


OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS
2. Removing the electrical parts box (1) Remove the panel. (2) Remove the address board cover. (3) Remove the electrical parts cover. (4) Disconnect the connectors of fan motor, vane motor, drain pump, room temperature thermistor, pipe temperature thermistor, condenser/evaporator temperature thermistor, and drain sensor on the electrical controller board. (5) Disconnect the lead wire and earth wire from terminal block. (6)Remove the electrical parts box.	**Photo 2**  **Photo 3** 
3. Removing the nozzle **Note when the nozzle is removed** **· The insulation material (white) which prevents water drop is mounted to the side of vane motor, remove the insulation material before removing nozzle. (See figure 4)** **· After completing the service, re-mount the insulation material as before as shown in right figure.** **· After service, mount the double layer insulation without fail. The hard material side should be faced toward the nozzle. (See figure 4)** (1) Remove the panel. (2) Remove the room temperature thermistor. (3) Unhook the claw in the middle of nozzle and remove the drain pan. (5 screws) (See photo 2) (4) Remove the nozzle side of the heat exchanger.(2 screws) (5) Remove the address board cover. (6) Remove the electrical parts cover. (7) Disconnect the connector of vane motor. (8) Remove the insulation material (white) on the right side of nozzle. (9)Remove the nozzle. (6 screws)	**Photo 4**  **Figure 4** 
4. Removing the vane motor (1) Remove the nozzle. Refer to above-mentioned (3) Removing the nozzle. (2) Remove the vane motor.	**Photo 5** 

OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS
5. Removing the drain pump (1) Remove the panel. (2) Unhook the claw in the middle of nozzle and remove the drain pan. (3) Remove the address board cover. (4) Remove the electrical parts cover. (5) Disconnect the connector of drain pump. (6) Remove the drain hose. (7) Remove the drain pump.(2 screws)	**Photo 6** 
6. Removing the fan motor and line flow fan (1) Remove the panel. (2) Unhook the claw in the middle of nozzle and remove the drain pan. (3) Unscrew 2 screws at the nozzle side of the heat exchanger. (4) Remove the address board cover. (5) Remove the electrical parts cover. (6) Disconnect the connector of vane motor,fan motor and drain pump. (7) Remove the nozzle side of the heat exchanger.(2 screws) (8) Remove the nozzle. (9) Remove the drain pump. (10) Unscrew 2 screws in the motor support. (11) Remove the fan motor and line flow fan (The fan motor and line flow fan can be removed without removing the heat exchanger.)	**Photo 7** 
7. Removing the thermistor<Room temperature detection> (1) Remove the panel. (2) Remove the address board cover. (3) Remove the electrical parts cover. (4) Remove the thermistor <intake temperature detector> (5) Disconnect the lead wire from the cord clamp (5 points) (6) Disconnect the connector (CN20) on the indoor controller board.	
8. Removing the thermistor **<Liquid pipe temperature detection>** **<Gas pipe temperature detection>** (1) Remove the panel. (2) Remove the address board cover. (3) Remove the electrical parts cover. (4) Remove the drain pan. (5) Remove the thermistor <Gas pipe temperature detection> /<Liquid pipe temperature detection>. (6) Disconnect the lead wire from the cord clamp (7) Disconnect the connector (CN21)/(CN29) on the indoor controller board.	

10 PARTS LIST

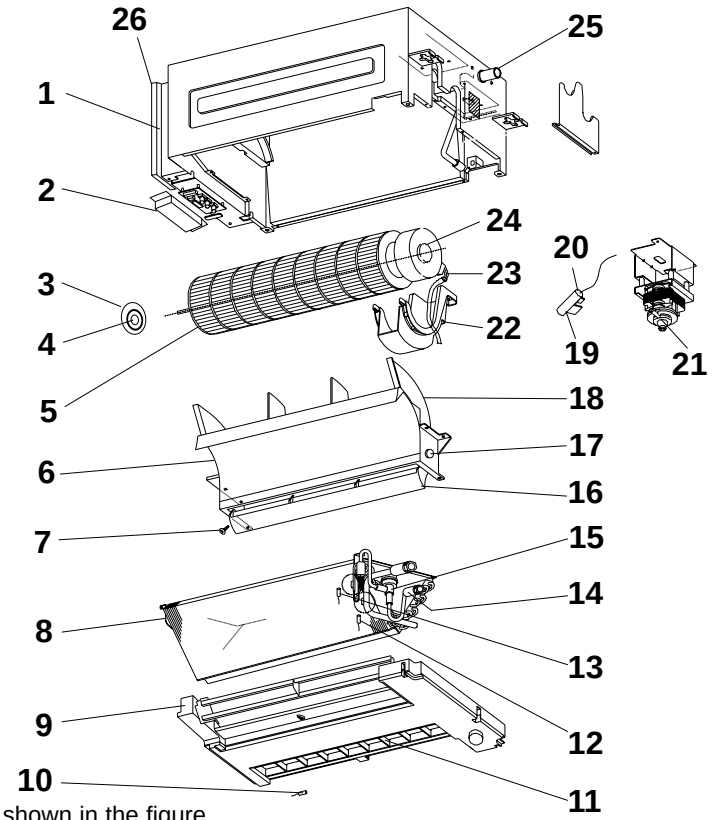
PANEL PARTS
PMP-16BMU



No.	Part No.	Part Name	Specification	Q'ty/set	Remarks (Drawing No.)	Wiring Diagram Symbol	Recommended Q'ty	Price	
				PMP-16BMU				Unit	Amount
1	T7W E11 003	AIR OUTLET GRILLE		1					
2	R01 E00 055	LATCH		2					
3	—	HANGER		2	(DT88D360H03)				
4	R01 E00 099	PANEL HOOK		2					
5	R01 E01 054	GRILLE CATCH		2					
6	R01 E01 500	L.L.FILTER		1					
7	R01 E02 500	L.L.FILTER		1					
8	TW7 E01 691	INTAKE GRILLE		1					
9	R01 E00 054	GRILLE CATCH		2					
10	R01 E00 648	RECEIVER COVER		1					
11	R01 E00 044	MAGNET		2					
12	R01 E00 096	SCREW CAP		1					
13	—	REMOTE CONTROLLER	PAR-21MAA	1		R.B			

This REMOTE CONTROLLER is made by AIR-CONDITIONING & REFRIGERATION SYSTEMS WORKS,. MITSUBISHI ELECTRIC CORPORATION.

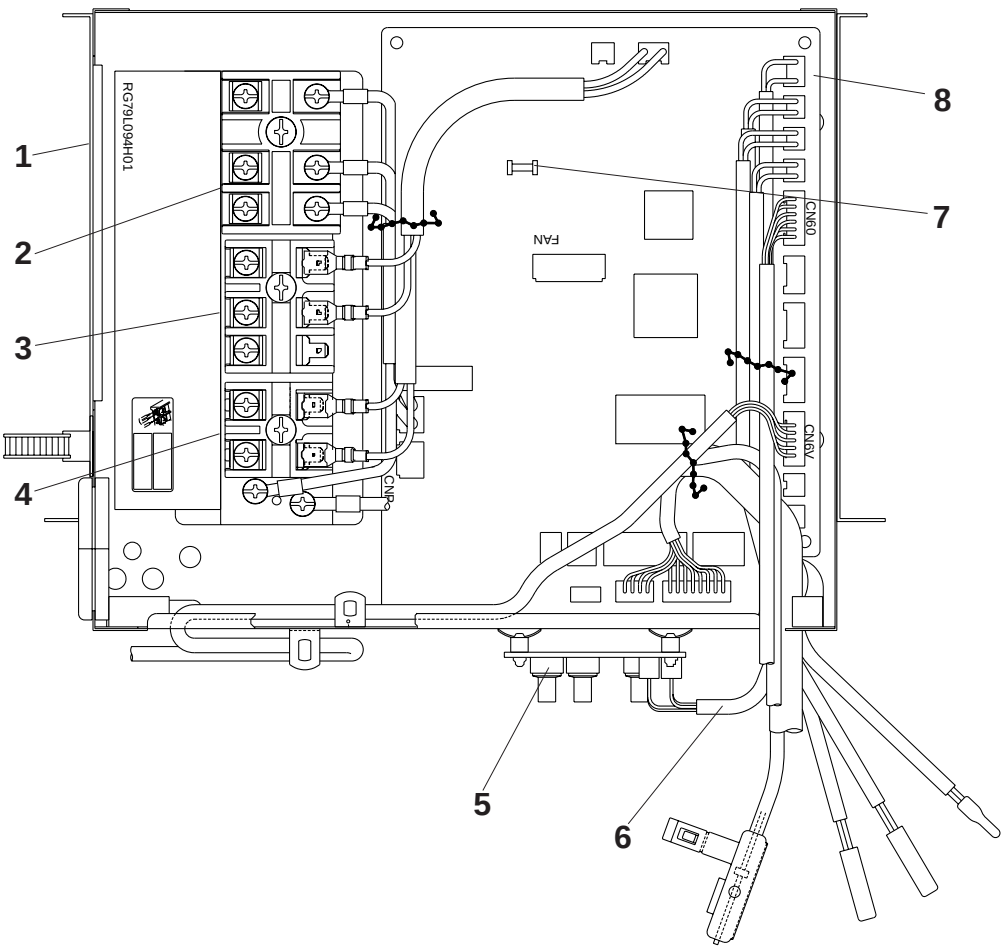
FUNCTIONAL PARTS
PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E



Part number that is circled is not shown in the figure.

No.	Part No.	Part Name	Specification	Q'ty/set		Remarks (Drawing No.)	Wiring Diagram Symbol	Recommended Q'ty	Price	
				PMFY-P · NBMU-E					Unit	Amount
				06/ 08	12/ 15					
1	—	CABINET		1	1	(DT00A478G81)				
2	—	ADDRESS BOARD COVER		1	1	(RG02L277H02)				
3	R01 22A 102	BEARING MOUNT		1	1					
4	R01 005 103	SLEEVE BEARING		1	1					
5	R01 E02 114	LINE FLOW FAN		1	1					
6	R01 E00 079	STABILIZER ASSY		1	1					
7	R01 E00 092	VANE SLEEVE		1	1					
8	T7W K08 480	HEAT EXCHANGER		1						
	T7W K09 480	HEAT EXCHANGER			1					
9	R01 E10 529	DRAIN PAN ASSY		1	1					
10	R01 E00 202	THERMISTOR	ROOM	1	1		TH21			
11	R01 E00 038	GUIDE VANE		1	1					
12	R01 E01 202	THERMISTOR	LIQUID	1	1		TH22			
13	R01 E03 202	THERMISTOR	GAS	1	1		TH23			
14	—	STRAINER PIPE		1	1	(BG14G637G07)				
15	R01 E66 401	LINEAR EXPANSION VALVE		1	1		LEV			
16	R01 E01 002	VANE		1	1					
17	R01 E01 223	VANE MOTOR		1	1		MV			
18	R01 E00 110	CASING ASSY		1	1					
19	R01 31K 241	SENSOR HOLDER		1	1					
20	R01 E01 266	DRAIN SENSOR		1	1		DS			
21	T7W E07 355	DRAIN PUMP		1	1		DP			
22	R01 E00 130	MOTOR SUPPORT		1	1					
23	R01 E14 220	FAN MOTOR		1	1		MF			
24	R01 E07 105	RUBBER MOUNT		1	1					
25	R01 E00 527	DRAIN PIPE ASSY		1	1					
26	—	CONTROL BOX COVER		1	1	(RG00L311G20)				
㉗	R01 E01 673	SCREW ASSY		1	1					

ELECTRICAL PARTS
PMFY-P06NBMU-E
PMFY-P08NBMU-E
PMFY-P12NBMU-E
PMFY-P15NBMU-E



No.	Part No.	Part Name	Specification	Q'ty/set PMFY-P06/ P08 /P12/ P15 NBMU-E	Remarks (Drawing No.)	Wiring Diagram Symbol	Recommended Q'ty	Price Unit	Price Amount
1	—	CONTROL BOX		1	(RG02B337G16)				
2	T7W E11 716	TERMINAL BLOCK	3P (L1,L2,G)	1		TB2			
3	T7W E17 716	TERMINAL BLOCK	3P (M1,M2,S)	1		TB5			
4	R01 556 246	TERMINAL BLOCK	2P(1,2)	1		TB15			
5	T7W E00 294	ADDRESS BOARD		1		A.B			
6	R01 E00 304	CABLE ASSY		1					
7	T7W 410 239	FUSE	250V 6A	1		FUSE			
8	T7W E43 310	INDOOR CONTROLLER BOARD	with POWER BOARD	1		I.B			

CITY MULTI

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